IN THE CLAIMS

Claim 1. (currently amended) A sensor for characterizing a fluid ~~composition~~, the sensor comprising a plurality of mechanical resonators ~~in combination~~ having at least two different structures, the plurality of resonators comprising a low frequency tuning fork resonator and a high frequency tuning fork frequency resonator, the plurality of resonators being adapted for measuring physical or chemical properties of the fluid ~~composition~~, at least one of the resonators having an operational frequency of less than 1 MHz.

Claim 2. (currently amended) The sensor of claim 1 wherein the plurality of resonators have ~~different structure,~~ different resonance frequencies ~~and combinations thereof~~.

Claim 3. (currently amended) The sensor of claim 2 wherein the plurality of resonators comprise different coatings, functionalities or combinations thereof.

Claim 4. (currently amended) The sensor of claim 3 further comprising at least one additional mechanical resonator ~~wherein the plurality of resonators are selected from a low frequency tuning fork resonator, a high frequency tuning fork frequency resonator, a trident tuning fork resonator, a length extension resonator, a torsion resonator, a thickness shear mode resonator, membrane oscillators, bimorphs, unimorphs, surface acoustic wave devices, and combinations thereof~~.

Claim 5. (currently amended) The sensor of claim ~~4, 1~~ wherein the plurality of resonators ~~within the array~~ are ~~simultaneously operated in different modes of oscillation selected from self-oscillating,~~ excited by ~~the~~ a sweep generator~~, operated in free decay mode, and combinations thereof~~.

Claim 6. (currently amended) The sensor of claim 5 further comprising a measurement circuit coupled with the resonators, ~~said~~ the measurement circuit having a signal generator for generating a variable frequency input signal to cause the resonators to oscillate, and a receiver coupled to the measurement circuit to output a frequency response of the resonators~~, a receiver coupled to the measurement circuit to output free decay response of the resonator, a self-oscillating unit in a feedback loop with the said resonators to cause the resonators to oscillate, a gain control unit for keeping the amplitude of oscillation at a constant level, a pulse generator that provides shock excitation to the said resonator and combinations thereof.~~

Claim 7. (currently amended) The sensor of claim 1 ~~2~~ wherein the plurality of resonators further comprise ~~a tuning fork resonator and~~ a thickness shear mode resonator.

Claim 8. (cancelled)

Claim 9. (cancelled)

Claim 10. (currently amended) The sensor of ~~claims~~ claim 3 wherein the plurality of resonators comprise different functionalities, each of the functionalities designed to bond with a different target molecule.

Claim 11. (original) The sensor of claim 3 wherein the plurality of resonators comprise tuning fork resonators functionalized with a polymer layer or other selective absorbing layer to detect the presence of specific molecules in a vapor.

Claim 12. (original) The sensor of claim 3 wherein the plurality of resonators comprise functionalized tuning fork resonators adapted to detect the presence of a specific chemical in a fluid composition.

Claim 13. (original) The sensor of claim 3 wherein the plurality of resonators are tuning fork resonators treated with a functionality that changes the resonance frequency of the tuning fork upon exposure to a selected target chemical.

Claim 14. (original) The sensor of claim 3 wherein the plurality of resonators are tuning fork resonators covered with receptor molecules that bond with specific target molecules.

Claim 15. (original) The sensor of claim 3 wherein the plurality of resonators are tuning fork resonators functionalized with a material that physically changes when exposed to molecules of a selected chemical, such that the mechanical drag on the tuning fork changes upon exposure to the selected chemical.

Claim 16. (original) The sensor of claim 3 wherein the plurality of resonators are tuning fork resonators comprising hydrophobic or hydrophilic functionality.

Claim 17. (currently amended) The sensor of claim ~~4~~ 1 wherein each of the plurality of resonators has an operational ~~the signal generator is adapted for generating an input signal at a~~ frequency of less than 1 MHz.

Claim 18. (currently amended) The sensor of claim ~~6~~ 1 wherein the plurality of resonators are attached together by a common base.

Claim 19. (currently amended) The sensor of claim ~~6~~ 1 wherein the plurality of resonators are attached to multiple frequency generating circuits adapted to measure properties of the fluid compositions over multiple frequency sweeps.

Claim 20. (new) The sensor of claim 1 wherein the resonators within the plurality are operated in free decay mode.

Claim 21. (new) The sensor of claim 20 further comprising a measurement circuit coupled with the resonators wherein a receiver is coupled to the measurement circuit to output free decay response of the resonator.

Claim 22. (new) The sensor of claim 1 wherein the resonators within the plurality are excited by a voltage spike.

Claim 23. (new) The sensor of claim 22 further comprising a pulse generator that provides a voltage spike to the resonators.

Claim 24. (new) The sensor of claim 1 wherein the resonators are adapted to operate in multiple mechanical modes.

Claim 25. (new) The sensor of claim 24 wherein the multiple mechanical modes are selected from compression mode, axial mode, torsion mode or combinations thereof.

Claim 26. (new) The sensor of claim 1 wherein tines of at least one of the tuning forks oscillate in opposite phases.

Claim 27. (new) A sensor for characterizing a fluid, the sensor comprising:

a plurality of mechanical resonators, each of the plurality of resonators having an operational frequency of less than 1 MHz, the plurality of resonators being adapted for measuring physical or chemical properties of the fluid, and

a sweep generator for generating a variable frequency input signal to cause the resonators to oscillate.

Claim 28. (new) The sensor of claim 27 further comprising a measurement circuit coupled with the resonators, the measurement circuit comprising the sweep generator and a receiver coupled to the measurement circuit to output a frequency response of the resonators.

Claim 29. (new) The sensor of claim 27 wherein the plurality of resonators have different structures, different resonance frequencies or combinations thereof.

Claim 30. (new) The sensor of claim 29 wherein the plurality of resonators comprise different coatings, functionalities or combinations thereof.

Claim 31. (new) The sensor of claim 30 wherein the plurality of resonators are selected from a low frequency tuning fork resonator, a high frequency tuning fork frequency resonator, a trident tuning fork resonator, a length extension resonator, a torsion resonator, a thickness shear mode resonator, bimorphs, unimorphs, and combinations thereof.

Claim 32. (new) A sensor for characterizing a fluid, the sensor comprising:

a plurality of mechanical resonators, each of the plurality of resonators having an operational frequency of less than 1 MHz, the plurality of resonators being adapted for measuring physical or chemical properties of the fluid, and

a measurement circuit adapted for operation of the plurality of mechanical resonators in free decay mode.

Claim 33. (new) The sensor of claim 32 wherein a receiver is coupled to the measurement circuit to output free decay responses of the resonators.

Claim 34. (new) The sensor of claim 32 wherein the plurality of resonators have different structures, different resonance frequencies or combinations thereof.

Claim 35. (new) The sensor of claim 34 wherein the plurality of resonators comprise different coatings, functionalities or combinations thereof.

Claim 36. (new) The sensor of claim 35 wherein the plurality of resonators are selected from a low frequency tuning fork resonator, a high frequency tuning fork frequency resonator, a trident tuning fork resonator, a length extension resonator, a torsion resonator, a thickness shear mode resonator, bimorphs, unimorphs, and combinations thereof.

Claim 37. (new) A sensor for characterizing a fluid, the sensor comprising:

a plurality of mechanical resonators, each of the plurality of resonators having an operational frequency of less than 1 MHz, the plurality of resonators being adapted for measuring physical or chemical properties of the fluid, and

a pulse generator for generating a voltage spike input signal to cause the resonators to oscillate.

Claim 38. (new) The sensor of claim 37 wherein the plurality of resonators have different structures, different resonance frequencies or combinations thereof.

Claim 39. (new) The sensor of claim 38 wherein the plurality of resonators comprise different coatings, functionalities or combinations thereof.

Claim 40. (new) The sensor of claim 39 wherein the plurality of resonators are selected from a low frequency tuning fork resonator, a high frequency tuning fork frequency resonator, a trident tuning fork resonator, a length extension resonator, a torsion resonator, a thickness shear mode resonator, bimorphs, unimorphs, and combinations thereof.